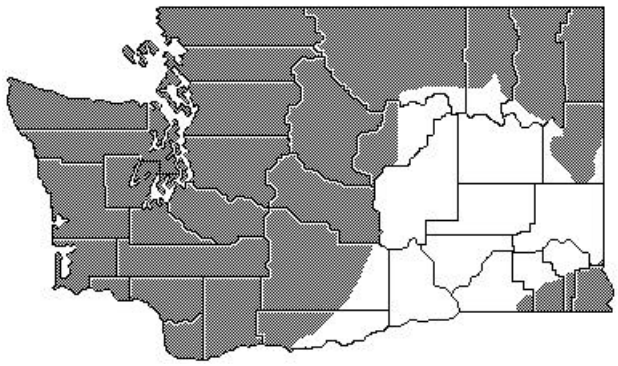
Washington Department of Fish & Wildlife's
Priority Habitat and Species Management Recommendations
Volume IV: Birds

Pileated Woodpecker
Dryocopus pileatus

Prepared by Jeffrey C. Lewis and Jeffrey M. Azerrad

GENERAL RANGE AND WASHINGTON DISTRIBUTION

Pileated woodpeckers are year-round residents from northern British Columbia, across Canada to Nova Scotia, south through central California, Idaho, Montana, eastern Kansas, the Gulf Coast and Florida (Bull and Jackson 1995). The Washington range encompasses the forested areas of the state (Smith et al. 1997).



General range of the pileated woodpecker, *Dryocopus pileatus*, in Washington (Smith et al. 1997).

RATIONALE

The pileated woodpecker is listed as a State Candidate species in Washington. The pileated woodpecker is a significant functional component of a forest environment because it creates nesting cavities used by other forest wildlife species (Aubry and Raley 2002a). Their deep foraging excavations provide foraging opportunities for weak excavators, and they accelerate the decay process by physically breaking apart wood and exposing prey that can be consumed by other species (Aubry and Raley 2002a). For these reasons the pileated woodpecker is considered a "keystone habitat modifier" (Aubry and Raley 2002a). The availability of large snags (standing dead trees) and large decaying live trees used for nesting and roosting by pileated woodpeckers has declined in many areas as a result of forest conversion (e.g, removal of forest for urban development) and timber management practices (Bull and Jackson 1995, Ferguson et al. 2001).

HABITAT REQUIREMENTS

Pileated woodpeckers inhabit mature and old-growth forests, and second-growth forests with large snags and fallen trees (Bull and Jackson 1995, Aubry and Raley 1996). Large snags and large decaying live trees in older forests are used by pileated woodpeckers for nesting and roosting throughout their range (Mellen et al. 1992, Bull and Jackson 1995, Aubry and Raley 2002b). In western Oregon and western Washington, they may use younger forests (<40 years old) as foraging habitat (Mellen et al. 1992, Aubry and Raley 1996).

Nesting and Roosting

Pileated woodpeckers excavate large nest cavities in snags or large decaying live trees (Bull et al. 1986, Aubry and Raley 2002b). In northeast Oregon, Bull (1987) reported the dimension of the nest entrances were 12 cm (5 in) in height and 9 cm (4 in) in width; the internal dimensions were 57 cm (22 in) deep and 21 cm (8 in) wide. Wood chips are typically found on the cavity floor (Bull and Jackson 1995). During the breeding season, birds may start a number of cavity excavations, but only complete one nest cavity (Bull and Jackson 1995, Aubry and Raley 2002a). The breeding and nesting periods of the pileated woodpecker extends from late March to early July (Bull et al. 1990). Pileated woodpeckers lay 1-6 eggs/clutch; the eggs are white in coloration and are about 3.3 cm (1.3 in) in length and 2.5 cm (1 in) in breadth (Bull and Jackson 1995).

Preferred nest tree species and characteristics vary to some degree among different regions of the northwest (Table 1). Most nest cavities were observed in hard snags with intact bark and broken tops, or live trees with dead tops. Hard snags are characterized as being comprised of sound wood while soft snags are composed primarily of wood in advanced stages of decay or deterioration (Brown 1985). Researchers studying pileated woodpeckers on the Olympic Peninsula found that woodpeckers used snags and large decaying live trees for nesting (Aubry and Raley 2002b). Sites used for nesting and roosting in the Olympics had a higher diversity of tree species and a greater density of large decaying live trees and large snags than surrounding forested areas (Aubry and Raley 2002b).

Table 1. Diameter at breast height (DBH), height, and tree species reported for pileated woodpecker nest trees in Oregon and Washington.

Location	DBH (average)	DBH (range)	Height (average)	Height (range)	Species	References
Olympic Peninsula	101 cm (40 in)	65-154 cm (26-61 in)	39 m (128 ft)	17-56 m (56-184 ft)	Pacific silver fir (*Abies amabilis*), western hemlock (*Tsuga heterophylla*)	Aubry and Raley 2002b
Western Oregon	69 cm (27 in)	--	27 m (87 ft)	--	Douglas-fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*)	Mellen 1987, Nelson 1989
Northeastern Oregon	80-84 cm (31-33 in)	52-119 cm (20-47 in)	28 m (92 ft)	10-43 m (33-141 ft)	grand fir, ponderosa pine (*Pinus ponderosa*), western larch (*Larix occidentalis*)	Bull 1987; Bull et al. 1992b; E. Bull, personal communication

Pileated woodpeckers roost in hollow trees or vacated nest cavities at night and during inclement weather (Bull and Jackson 1995). Excavation of roost cavities may occur at any time during the year (E. Bull, personal communication). Pileated woodpeckers may use up to 11 roosts over a 3-10 month period; however, some individuals will use one roost for a long period before switching to a new roost, while others regularly switch among several roosts (Bull et al. 1992b). The availability of roost trees apparently explained why some birds roosted in a limited number of trees (Bull et al. 1992b)

Roost and nest trees of pileated woodpeckers differ with respect to species and physical characteristics. Pileated woodpeckers used live trees or snags for roosting and nesting and selected these based on tree species, wood condition and diameter at breast

height (dbh) in both northeastern Oregon and the Olympic peninsula (Bull et al. 1992b, Aubry and Raley 2002b). Bull et al. (1992b) reported that roost trees [mean = 70 cm dbh (28 in)] were smaller than nest trees [mean = 80 cm dbh (31 in)]; in contrast to nest trees, roosts trees in northeastern Oregon were often hollow. The hollow interior of roost chambers was typically the result of heartwood decay rather than excavation (Bull et al. 1992b, Aubry and Raley 2002b). In northeastern Oregon, roost chambers had more entrance holes than nests, and roosts were predominantly in grand fir, whereas nest trees were predominantly ponderosa pine and western larch (Bull et al. 1992b). In the Olympics, pileated woodpeckers preferred to roost within western redcedar (*Thuja plicata*) (Aubry and Raley 2002b). The extensive use of grand fir in northeast Oregon and western redcedar in the Olympics was attributed to the greater propensity for these species to form large, hollow chambers (Bull et al. 1992b, Aubry and Raley 2002b). Aubry and Raley (1996) found that 88% of all roosts were located in old or mature forests. The remaining roosts were primarily found in naturally regenerated young forests that were approximately 75 years old (Aubry and Raley 1996). Roosts east of the Cascades were also primarily found in old-growth forests (Bull et al. 1992b, McClelland and McClelland 1999). General characteristics of roost trees in Oregon and Washington are described in Table 2.

Table 2. DBH, height, and tree species reported for pileated woodpecker roost trees in Oregon and Washington.

Location	DBH (average)	DBH (range)	Height (average)	Height (range)	Species	References
Olympic Peninsula	149 cm (59 in)	37-309 cm (15-122 in)	36.5 m (120 ft)	11-63 m (36-207 ft)	Pacific silver fir, western hemlock, western redcedar	Aubry and Raley 2002b
Western Oregon	112 cm (44 in)	40-208 cm (16-82 in)	--	--	--	Mellen et al. 1992
Northeastern Oregon	71 cm (28 in)	40-131 cm (16-52 ft)	22 m (72 ft)	6-44 m (20-144 ft)	grand fir, ponderosa pine, western larch	Bull et al. 1992b; E. Bull, personal communication

Foraging

Pileated woodpeckers forage in forests containing large trees and snags that support abundant insect prey associated with dead and dying wood. Large rectangular/oval excavations in snags are indicative of pileated woodpecker foraging (McClelland 1979, Neitro et al. 1985, Bull and Jackson 1995). In Oregon and Washington, prey consisted of carpenter and thatching ants (Hymenoptera), beetle larvae (Coleoptera), termites (Isoptera), and other insects (Bull et al. 1992a, Torgersen and Bull 1995, Aubry and Raley 1996). Mature and old-growth coniferous forest are considered high quality foraging habitat (Aubry and Raley 1996), but forests as young as 40 years of age are used if snags, particularly large residual snags from burns or harvests, are present (Mellen et al. 1992). Pileated woodpeckers seldom use clearcuts, but will forage in clearcuts or shelterwood cuts if substantial foraging habitat is retained (see Mannan 1984, Mellen 1987). Researchers working in the Oregon Coastal Range determined that pileated woodpeckers used deciduous riparian for foraging activities (Mellen et al. 1992).

Pileated woodpeckers forage on large snags [>50 cm (20 in) dbh], live trees, logs, and stumps (Bull et al. 1986, Bull 1987, Torgersen and Bull 1995). Snags and live trees take on special importance in winter when logs and stumps may be covered with snow (McClelland 1979, Bull and Holthausen 1993). Pileated woodpeckers forage on snags in a broad range of decay conditions but appear to prefer large snags that may harbor more insects and larvae than smaller snags (Mannan et al. 1980). In contrast to foraging behavior east of the Cascade Range, downed logs are rarely used as foraging substrate in wet coastal forests (Aubry and Raley 2002b).

Home Range

Home ranges vary in size within the Pacific Northwest, ranging from 407 ha (1,006 ac)/breeding pair (data collected between June and March) in northeastern Oregon (Bull and Holthausen 1993), 480 ha (1,186 ac)/breeding pair during the summer in the central Oregon Coast Range (Mellen et al. 1992), and 863 ha (2,132 ac)/breeding pair annually on the Olympic Peninsula (Aubry and Raley 1996). The home range figures reported in the central Oregon Coast Range are likely smaller than the actual year-round home range for the pileated (Mellen et al. 1992). Home ranges for individuals that lost mates are larger than those of mated individuals (Bull and Holthausen 1993, Aubry and Raley 1996), and pairs with young have larger home ranges than pairs without young (Mellen et al. 1992). Although home ranges in the central Oregon Coast Range were actively defended, the ranges of adjacent birds overlapped (9-30% of an individual's home range overlapped) (Mellen et al. 1992). Home ranges in northeastern Oregon generally consisted of >85% forested habitat (Bull and Holthausen 1993). Home ranges consisted primarily of late-successional forested habitat or second-growth forest with residual large snags (Bull and Holthausen 1993, Bull and Jackson 1995, Aubry and Raley 1996).

Urban/Suburban Habitat Use

Pileated woodpeckers are residents in some developing areas throughout Washington (M. Tirhi; P. Thompson; H. Ferguson, personal communications). In these areas they occupy remnant patches of forest, parks, and green-belts. Because of their need for large trees and their sizeable territory requirements, loss or reduction of extensive wooded tracts and large trees will impact the species (Moulton and Adams 1991). Pileated woodpeckers in suburban areas forage on a variety of substrates, including large and small diameter coniferous and hardwood trees and snags (P. Thompson, personal communication; J. Lewis, unpublished data), and occasionally on suet feeders, utility poles, and fruit trees (Bull and Jackson 1995; J. Buchanan, personal communication).

Although habitat use in urbanizing environments in Washington has been given little attention, it is likely that pileated woodpeckers select large diameter trees and snags for nesting and roosting. Similarly, sizes of home ranges in urban environments are unknown, but they may be relatively large due to the fragmented nature of remnant forest habitats in most suburban landscapes. The relationship between cavity-nesters and urbanizing areas in Washington has only been investigated by a single study in the greater Seattle area (see Rohila 2002)

LIMITING FACTORS

Timber harvest can significantly impact pileated woodpecker habitat (Bull and Jackson 1995). The removal of large snags, large decaying live trees and downed woody debris of the appropriate species, size and decay class eliminates nest and roost sites and foraging habitat. Intensively managed forests typically do not retain these habitat features (Spies and Cline 1988). However, more recent state and federal forest management guidelines call for the retention of a specified number of wildlife trees during timber harvest (Washington Forest Practices Board 2001, Aubry and Raley 2002a). Bull and Jackson (1995) suggest that fragmentation of forested habitat may lead to reduced population density and increased vulnerability to predation as birds are forced to fly between fragmented forested stands; however, information on predation effects is currently lacking. Known predators include the northern goshawk (*Accipiter gentiles*), Cooper's hawk (*A. cooperii*), red-tailed hawk (*Buteo jamaicensis*), great horned owl (*Bubo virginianus*), American martin (*Martes americana*), and gray fox (*Urocyon cinereoargenteus*) (Bull and Jackson 1995).

The amount of forest retained in the suburban and urbanizing environment will influence the degree to which an area is used by pileated woodpeckers for foraging and reproduction (Moulton and Adams 1991, Rohila 2002). If the collective area of these retained forest tracts is large enough, suburban and other urbanizing environments could support pileated woodpeckers (Rohila 2002). However, because of their need for larger trees and their sizeable territory requirements, loss or reduction of wooded tracts and large trees could eliminate or preclude pileated woodpeckers from an urbanizing area (Moulton and Adams 1991).

MANAGEMENT RECOMMENDATIONS

General Recommendations

Specific management prescriptions should be developed for actions that will be undertaken at the home range scale (Mellen et al. 1992, Bull and Holthausen 1993) as discussed later in this chapter. Management activities for pileated woodpeckers should focus on providing and maintaining a sufficient number of appropriate large snags and large decaying live trees for nesting and roosting (Aubry and Raley 2002b). Retaining snags and decaying live trees (of appropriate size, species and decay classes) provides suitable nesting and roosting structure for a longer period of time than retaining only hard snags (Aubry and Raley 2002b). Trees, snags and stumps with existing pileated nest cavities and foraging excavations should be retained (Bonar 2001).

Management of nesting and roosting habitat may be accomplished in several ways in managed forests. A variety of snag creation techniques are being developed and it is likely that such techniques can produce suitable snags in older second growth forests (e.g., removal of tree-top, girdling) (Neitro et al. 1985, Bull and Partridge 1986, Lewis 1998). Properly conducted uneven-aged management of forest stands can create adequate canopy closure and sufficient large snags and large decaying live trees to maintain suitable nesting and roosting habitat for pileated woodpeckers. Defective or cull trees can be retained during commercial thinning operations, or these can be recruited to become snags in subsequent rotations (Neitro et al. 1985). Because of the difficulties in recruiting large snags in managed forests (Wilhere 2003), one of the most effective means to improve snag densities may involve extending the length of harvest rotations (Neitro et al. 1985).

Managers may have some flexibility when providing foraging habitat. Naturally formed stumps and numerous large logs in various stages of decay can be retained to improve foraging habitat (Torgersen and Bull 1995). Management for large snags, culls, and green replacement trees can ultimately provide large downed logs as foraging habitat. Protection of riparian habitat throughout Washington and the provisions of buffers along streams may also ensure that adequate foraging habitat exists for pileated woodpeckers (Mellen et al. 1992, Knutson and Naef 1997). However, we currently lack adequate information to define appropriate riparian buffers for pileated woodpeckers in managed forests.

Forest managers often apply minimum size standards that are determined through research (e.g., the smallest recorded nest tree dbh) to achieve a combination of wildlife conservation and resource extraction goals (McClelland and McClelland 1999). Conner (1979) argued that managing forests using minimum size standards may cause gradual population declines and suggested that average values for habitat components should be used in forest management. The following set of recommendations is based primarily on average (rather than minimum) standards.

Western Washington

The following recommendations are primarily based on the goals identified by the Partners in Flight (PIF) Conservation Plan for the Westside Coniferous Forest region (Altman 1999). These goals were derived from research conducted in the Oregon Coast Range and Washington's Olympic Peninsula (Nelson 1989, Mellen et al. 1992, Aubry and Raley 1996, 2002b). The PIF recommendations for managed coniferous forests (stands with >70% conifer stems) of about 60 years of age or older include maintaining >70% canopy closure and an average of $\geq$5 nest snags/10 ha (2 snags/10 ac) that are >76 cm dbh (30 in). In areas used for both nesting and roosting, an average of 18 large snags/ha (7 snags/ac) and 8 decaying large trees/ha (3 trees/ac) should be retained (Aubry and Raley 2002b). Trees $\geq$27.5 m ($\geq$90 ft) in height should be retained to provide nesting and roosting structures (Aubry and Raley 2002b). Overall, pileated woodpeckers selected larger trees for roosting than those used for nesting (see Buchanan, in press). Based on Aubry and Raley's (2002b) work in the Olympics, trees between 155 and 309 cm dbh (61-122 in) should be retained for roosting. In addition, an average of 30 foraging snags/ha (12 snags/ac) (mix of hard and soft snags) should be provided in the following size classes (Altman 1999):

Size class	Foraging snags retained
• 25-50 cm dbh (10-20 in) = ≥18 snags/ha (7 snags/ac)	
• 51-76 cm dbh (20-30 in) = ≥8 snags/ha (3 snags/ac)	
• >76 cm dbh (>30 in) = ≥5 snags/ha (2 snags/ac)	

Population targets suggested by the PIF conservation plan called for about nine pairs of pileated woodpeckers per township (9.7 pairs/100 km^2), based on an average breeding season home range of 600 ha (Altman 1999:36-37). Using the annual home range size of 863 ha for the Olympic Peninsula (Aubry and Raley 1996), a comparable target could be adjusted to about six pairs per township (6.4/100 km^2) on the Olympic Peninsula (Buchanan, in press). At the landscape-level, an average of 60% of a landscape management unit (e.g., watershed, township) should be retained as suitable habitat (early successional forest with adequate snag densities, young forest [40-80 years] with adequate snag densities, and late successional forest), and >40% of this suitable habitat should be retained in late-successional forest. Adequate snag densities are defined as the combination of nesting, roosting and foraging snag numbers (see above).

Eastern Washington

The following recommendations are based on research conducted in the Blue Mountains of northeastern Oregon (Bull 1987, Bull and Holthausen 1993) as well as research conducted in northwestern Montana (McClelland and McClelland 1999). Because most work on pileated woodpeckers in the inland northwest was conducted in the Blue Mountains, it should be noted that the following recommendations might be less applicable to areas outside of this region.

Several key habitat components are necessary to maintain suitable pileated woodpecker habitat. These include a mature forest with ≥2 canopy layers, the uppermost being 25-30 m (82-98 ft) in height; large live trees to provide cover and eventual replacement of dead trees; large dead trees for nesting; and dead trees and downed woody material for foraging (Bull 1987). Territory size for breeding pairs in the Blue Mountains averaged 407 ha (1006 ac) and was considered an adequate size to manage for each breeding pair in that region (Bull and Holthausen 1993). Researchers working in the Blue Mountains recommended that 75% of management areas be in grand fir forest types and they suggested that the composition of this area include 25% old growth and 75% mature stands. Additionally, they suggested that ≥50% of the management areas have ≥60% canopy closure and that at least 40% of the stands remain unlogged (Bull and Holthausen 1993).

Bull and Holthausen (1993) recommended retaining 8 snags/ha (3.2 snags/ac) with at least 20% being ≥ 51 cm (20 in) dbh for both nesting and roosting. Based on Bull's (1987) research, trees ≥ 28 m (92 ft) should be retained to provide nesting structures. Bull and Holthausen (1993) recommended retaining ≥100 logs/ha (40/ac) as foraging substrate in management areas, with a preference for logs ≥38 cm (15 in) dbh that include all species except lodgepole pine (*Pinus contorta* var. *latifolia*). McClelland and McClelland (1999) suggested that the optimum dbh for nest and roost trees should be: 77-91 cm (30-36 in) for western larch, 76-96 cm (30-38 in) for ponderosa pine, and 75-100 cm (30-39 in) for black cottonwood (*Populus balsamifera*).

Urban/Suburban Areas

Although pileated woodpeckers are known to use suburban and other urbanizing areas (Moulton and Adams 1991, Rohila 2002), few studies have examined habitat use in these areas. Consequently, the following generalized recommendations address the principle needs of pileated woodpeckers based primarily on the findings of a recent study conducted in the greater Seattle area (Rohila 2002). Additional research will be necessary to develop specific guidelines for urban and suburban areas.

In urbanizing areas, the greatest negative influence to pileated woodpeckers is likely the clearing of remnant forest patches. Based on research in greater Seattle, Rohila (2002) recommended that planners retain forest in the largest patches available (>30 ha [74 ac] would be considered large). Where large patches are unavailable, smaller patches should be retained; where the average size of smaller patches should be no less than approximately 3 ha (7 ac) (see Rohila 2002). Forest patches with high densities of existing snags and live trees should be targeted when selecting areas to retain during the planning process (Rohila 2002). The

creation of snags or decaying live trees (Lewis 1998) may benefit pileated woodpeckers in suburban areas (see previous sections for preferred snag and tree size guidelines). Pileated woodpeckers and other cavity-dependent species would benefit from the retention of snags as well as the retention of live trees in the largest size classes available in the stand (Rohila 2002). Because designated suburban and urban parks often contain large forested tracts, park managers should also consider pileated woodpecker requirements.

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PERSONAL COMMUNICATIONS

Joe Buchanan
Wildlife Biologist
Washington Department of Fish and Wildlife
Olympia, Washington

Evelyn Bull
Research Wildlife Biologist
USDA Forest Service
La Grande, Oregon

Howard Ferguson
District Wildlife Biologist
Washington Department of Fish and Wildlife
Spokane, Washington

Patricia Thompson
Urban Wildlife Biologist
Washington Department of Fish and Wildlife
Mill Creek, Washington

Michelle Tirhi
Urban Wildlife Biologist
Washington Department of Fish and Wildlife
Kent, Washington

KEY POINTS

Habitat Requirements

- Inhabits mature and old-growth forests, and second-growth forests with large snags and fallen trees
- Excavates large nest cavities in snags or large decaying live trees
- Breeds and nests between late March to early July
- Roosts in hollow trees or vacated nest cavities at night and during inclement weather
- Forages in forests containing large trees and snags, and dead and dying wood
- Preys on carpenter and thatching ants, beetle larvae, termites, and other insects
- Present in some urban and suburban areas throughout Washington

Management Recommendations

General Recommendations

- Maintain large snags and large decaying live trees for nesting and roosting
- Retain naturally formed stumps and numerous large logs in various stages of decay to improve foraging habitat
- Use average size standards (rather than minimums) for managing pileated woodpecker habitat components (e.g., nest size standards).

Western Washington

- Maintain managed coniferous forests (stands with >70% conifer stems) of about 60 years of age or older at>70% canopy closure and an average of $\geq$5 nest snags/10 ha (2 snags/10 ac) that are >76 cm dbh (30 in)
- Retain an average of 18 large snags/ha (7 snags/ac) and 8 decaying large trees/ha (3 trees/ac) in areas used for both nesting and roosting
- Retain trees $\geq$27.5 m ($\geq$90 ft) in height to provide nesting and roosting structures. Trees between 155 and 309 cm dbh (61-122 in) should be retained for roosting
- Retain an average of 30 foraging snags/ha (12 snags/ac)

Eastern Washington

- Maintain mature forest with $\geq$2 canopy layers, the uppermost being 25-30 m (82-98 ft) in height; large live trees to provide cover and eventual replacement of dead trees; large dead trees for nesting; and dead trees and downed woody material for foraging
- Retain 8 snags/ha (3.2 snags/ac) with at least 20% being $\geq$ 51 cm (20 in) dbh for both nesting and roosting
- Retain $\geq$100 logs/ha (40/ac) as foraging substrate in management areas, with a preference for logs $\geq$38 cm (15 in) dbh

Urban/Suburban Areas

- Conserve larger forest patches with large trees and snags
- Retain forest in the largest patches available ($\geq$30 ha [74 ac] would be considered large). Where large patches are unavailable, smaller patches should be retained; where the average size of smaller patches should be no less than approximately 3 ha (7 ac).
- Retain or create snags as well as the retain live trees in the largest size classes available in the stand